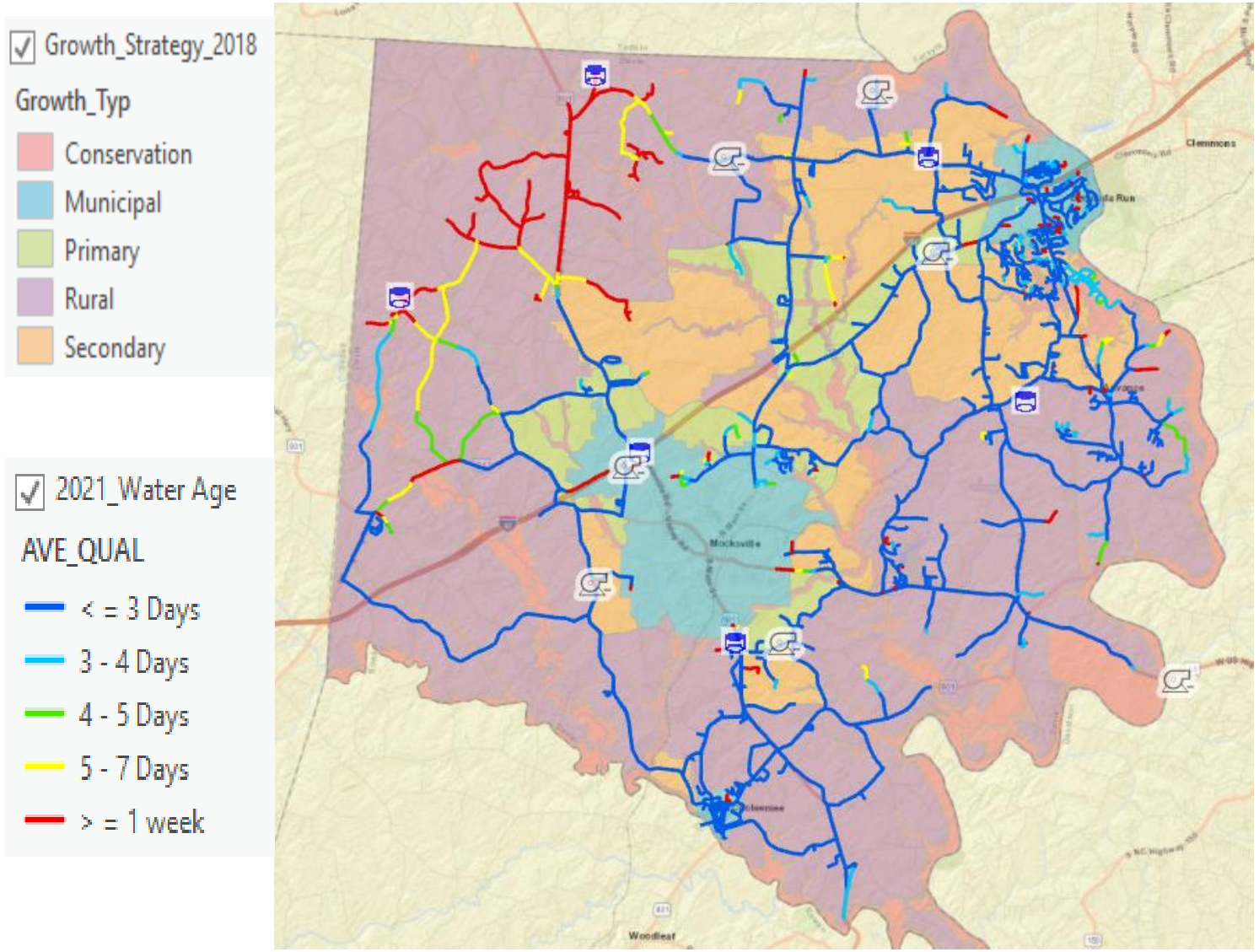
Davie County Public Utilities Master Plan Modeling 2021

1. GIS Overview
2. Task 1: Geo-referencing Billing Data
   - Link billing records meter locations and model nodes
   - Collect and process billing records and production data
2. Task 2: Hydraulic Grade Line Review
   - Conduct Two Hydraulic Gradient Tests
   - Hydraulic grade line refers to the water profile under pressure
   - Process Data, Simulate Tests, Compare Model to Test and Calibrate
3. Task 3: Water Age Analysis
   - Map existing system for water age and identify problem areas
   - Test improvements in up to five problem areas
4. Task 4: Water CIP Recommendations

GIS Mapping Overview – Current Overview

The following slides provide a high-level overview of the data incorporated into the Asset Management Plan GIS and how it was used in the identification of CIP recommendations.

Current Water Age



GIS Mapping Overview Pipe Age and Break History

MainLeaksApr21

Year

- 2014
- 2015
- 2016
- 2017
- 2018
- 2019 - 2021

Growth_Strategy_2018

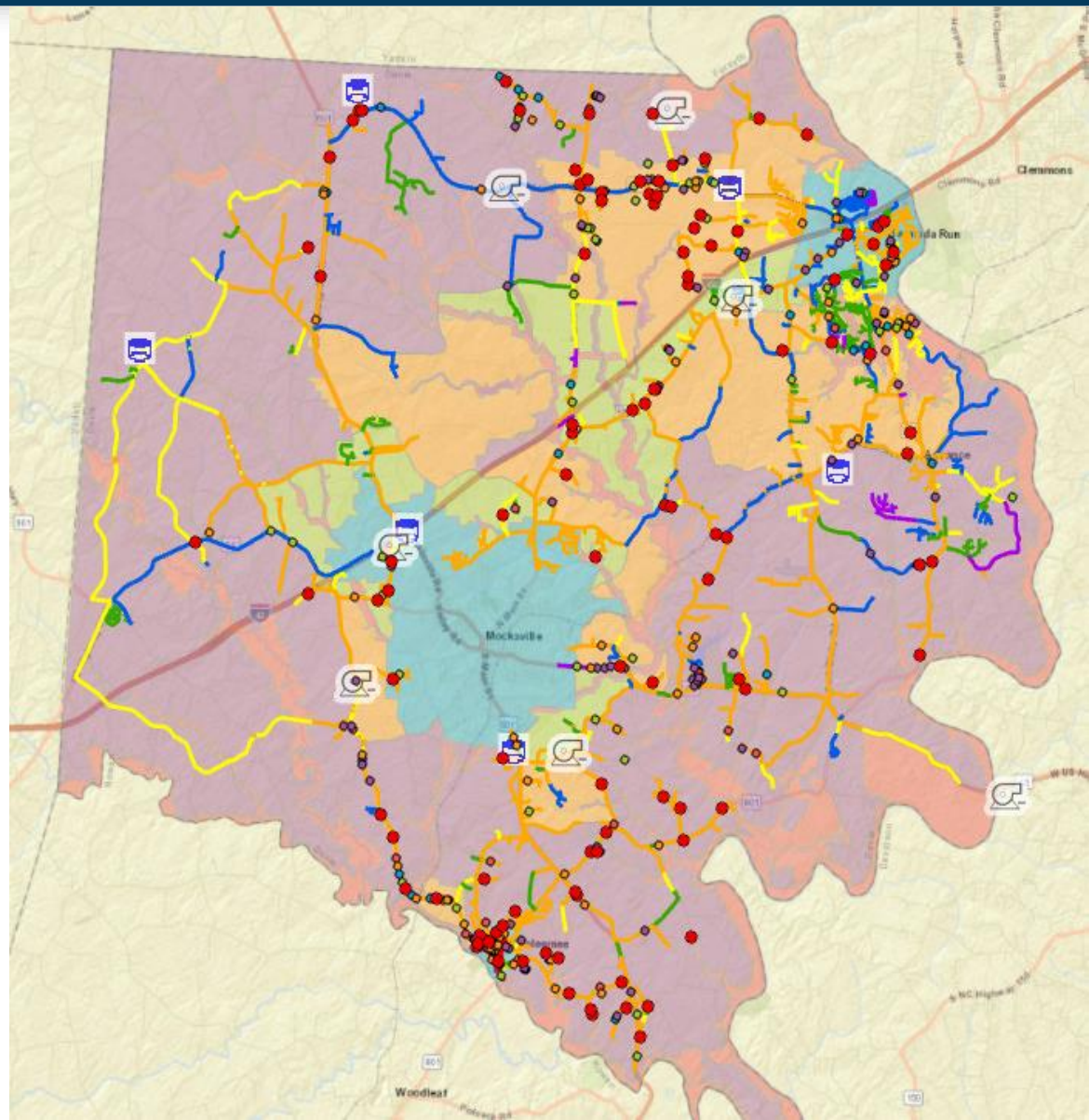
Growth_Typ

- Conservation
- Municipal
- Primary
- Rural
- Secondary

Water Main

Year Installed

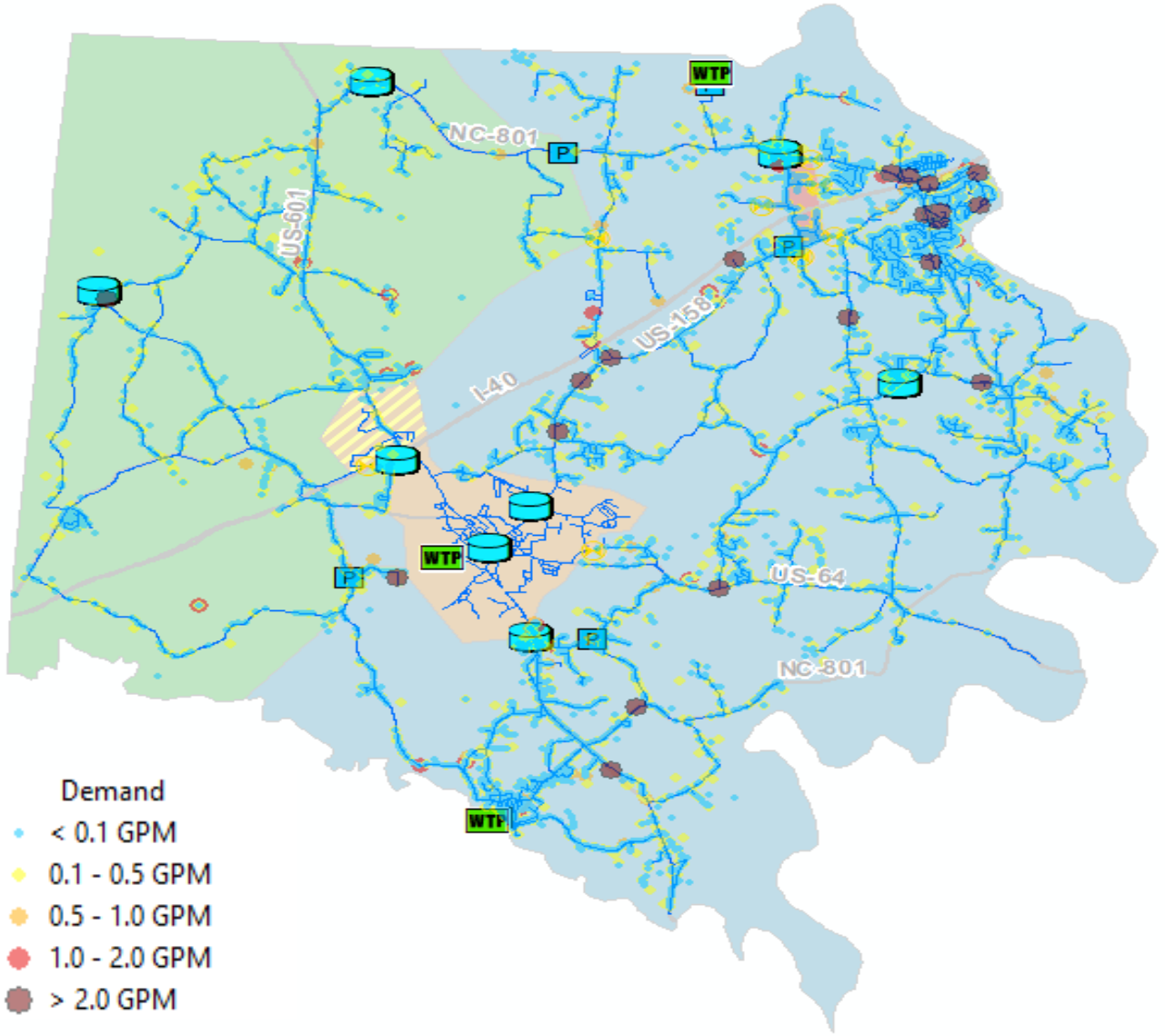
- 1930 - 1960
- 1971 - 1979
- 1980 - 1989
- 1990 - 1999
- 2000 - 2009
- 2010 - 2020



Geocoding Meters

Meters were geocoded using ArcGIS Pro's Geocode Address tool

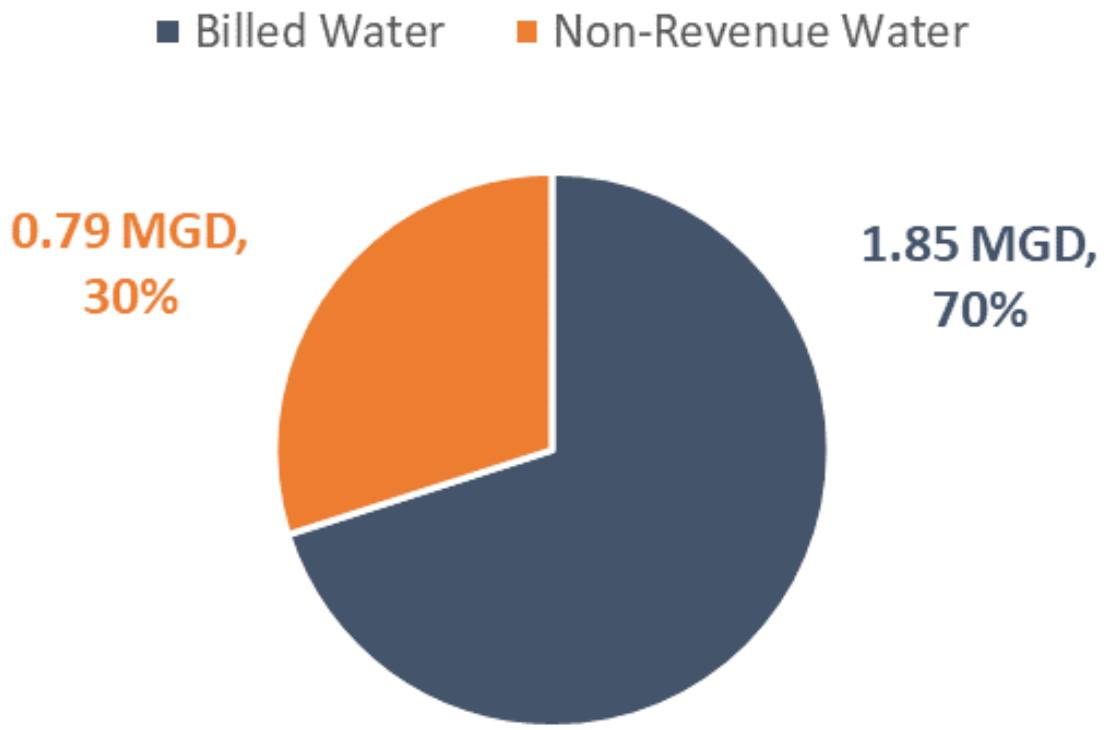
When exact street addresses were not available, meters were associated to the street itself



Billing and Production Data

Billing and Production Data for 2020

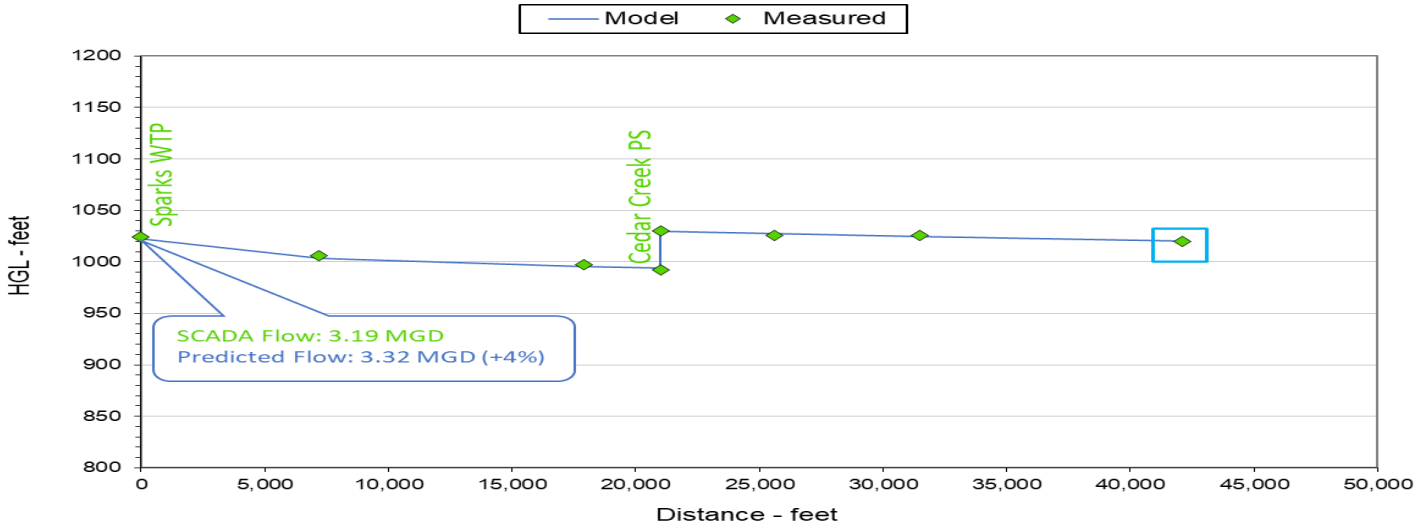
2020 Average (MGD)
2.64
1.85 (70%)
0.79 (30%)

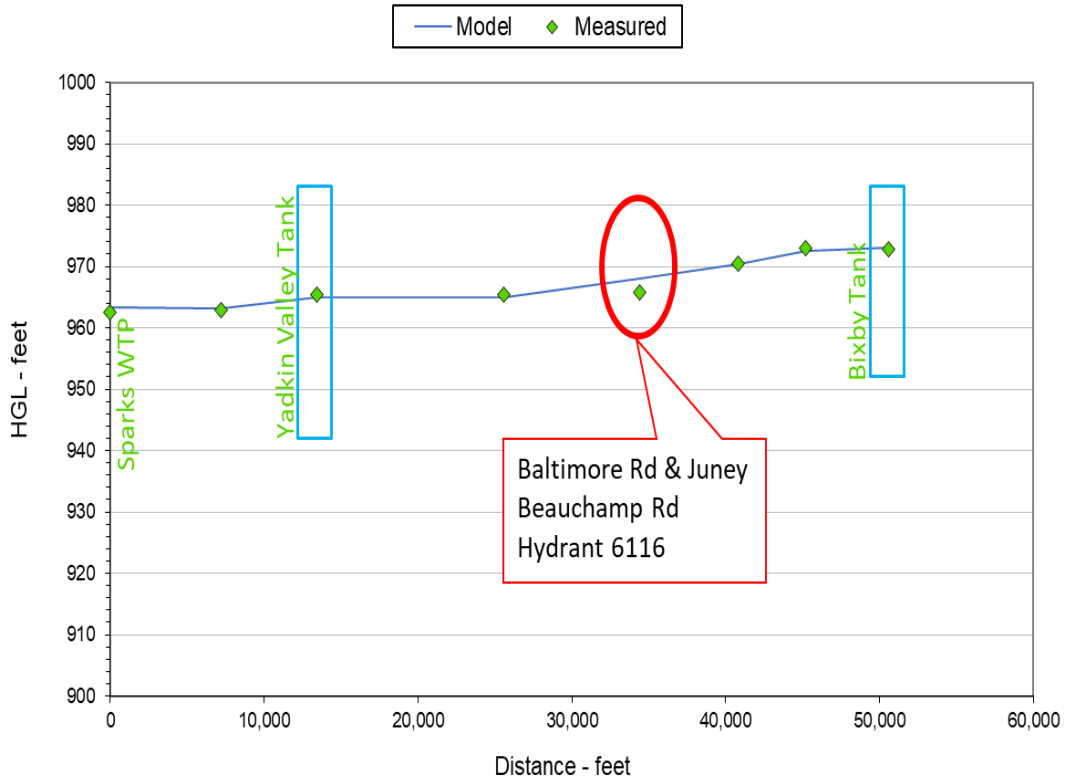


Hydraulic Grade Lines

Model accurately predicts the HGL test within 2 ft with the updated Pressure Reducing Valve setting

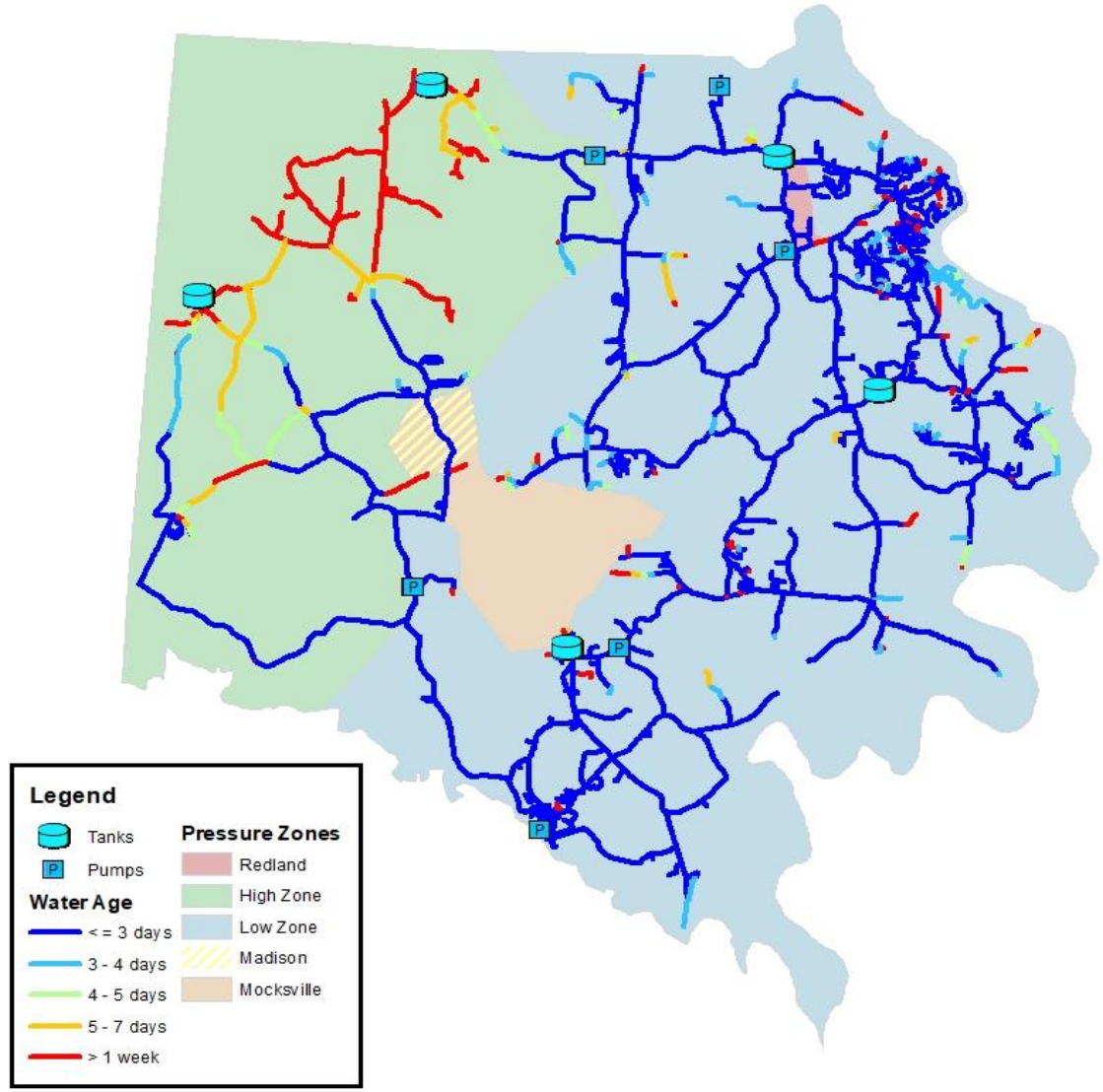
Location		Distance (feet)	Elevation (feet)	Measured Head (feet)	Measured HGL (ft)	Predicted HGL (ft)
B1	Sparks WTP - Hydrant 2515	0	780	183	963	963
B2	Hydrant #2589, Spillman Rd & NC-801	7,200	827	136	963	963
B3	Yadkin Valley Tank	13,400	856	109	965	965
B4	Hydrant #6237, Juney Beauchamp Rd &	25,600	871	94	965	965
B5	Hydrant #6116, Baltimore Rd & Juney Be	34,400	750	216	966	968
B6	Hydrant #4051, Montclair Dr & Baltimore	40,800	795	175	970	970
B7	Hydrant #7557, Princeton Ct & Baltimore	45,200	823	150	973	973
B8	Bixby Tank	50,600	845	128	973	973





Water Age Analysis

- Water age is often used as a surrogate for water quality
- Davie County's distribution system uses free chlorine
- Typical water age recommendation for free chlorine systems is 5 days
  - Every system is unique and may find acceptable limits for water quality may vary higher or lower than 5 days
- **New pipes on Main St and Hwy 601 near Cooleemee WTP are included**



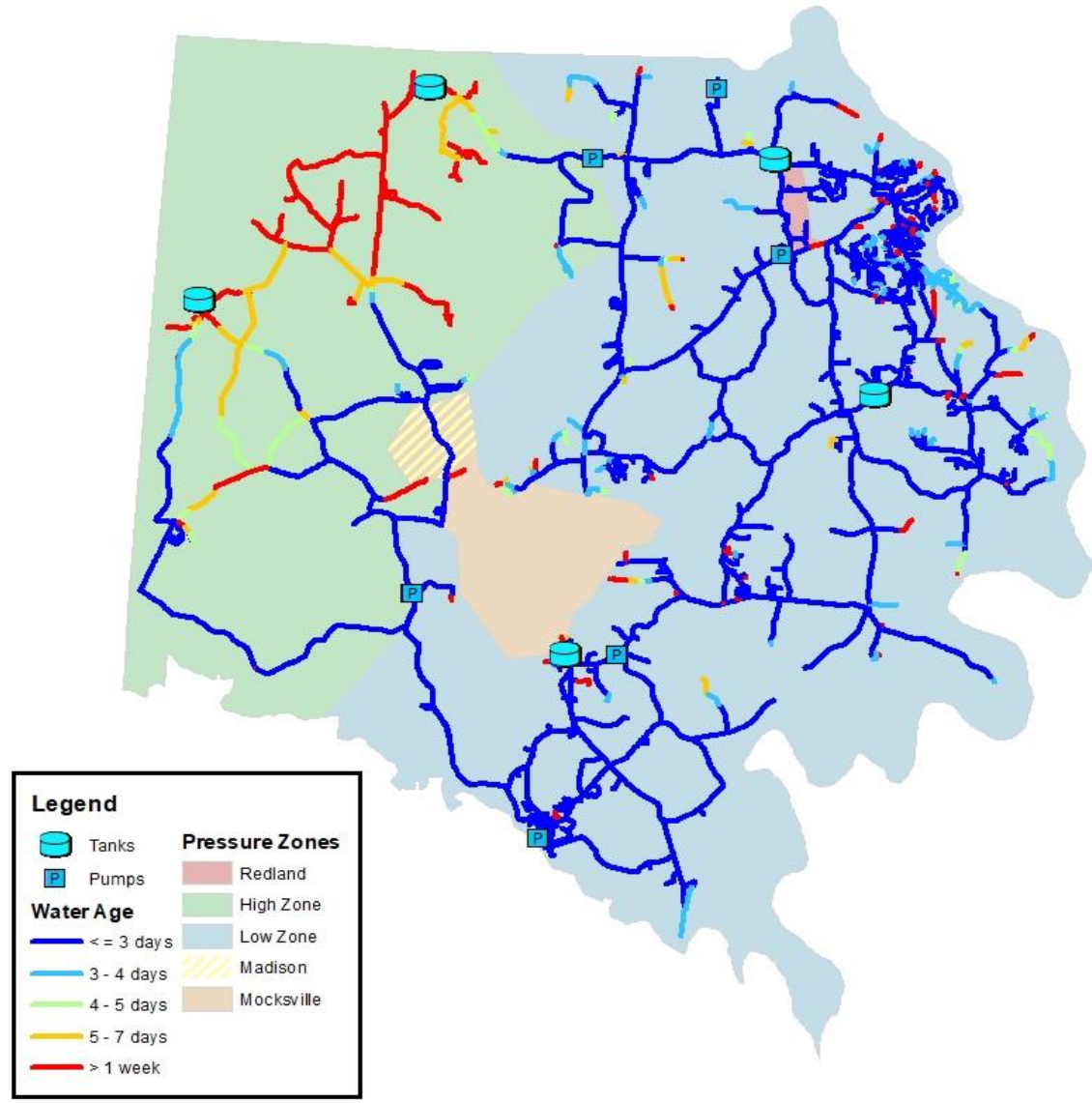
Water Age Analysis

Existing Water Age

- Water age is generally below 3 days in the low zone
- Water age exceeds 1 week in the high zone
- Sheffield Standpipe has exceedingly high water age

Areas of Interest

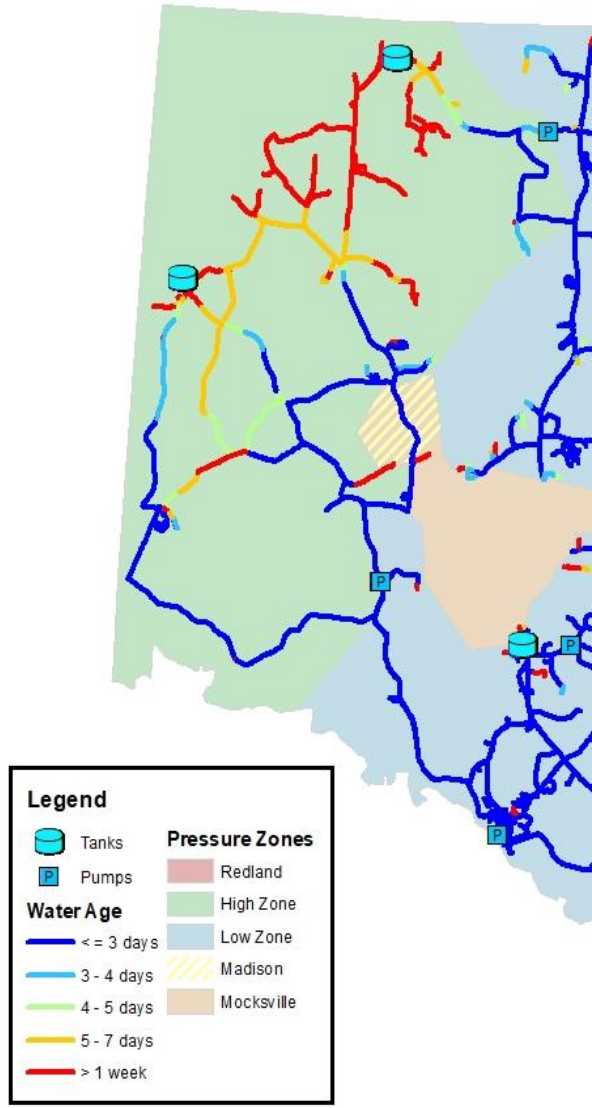
- Two areas identified for water quality improvements



Water Age High Zone Challenges

Sheffield Standpipe

- Sheffield Standpipe turns over from 50 to 55 ft (1018 to 1023 ft) out of 63.5 ft
- Low turnover range, typical to standpipes, results in higher water age
- **Taking the standpipe out of service greatly impacts local available fire flows and pressures without installing improvements**



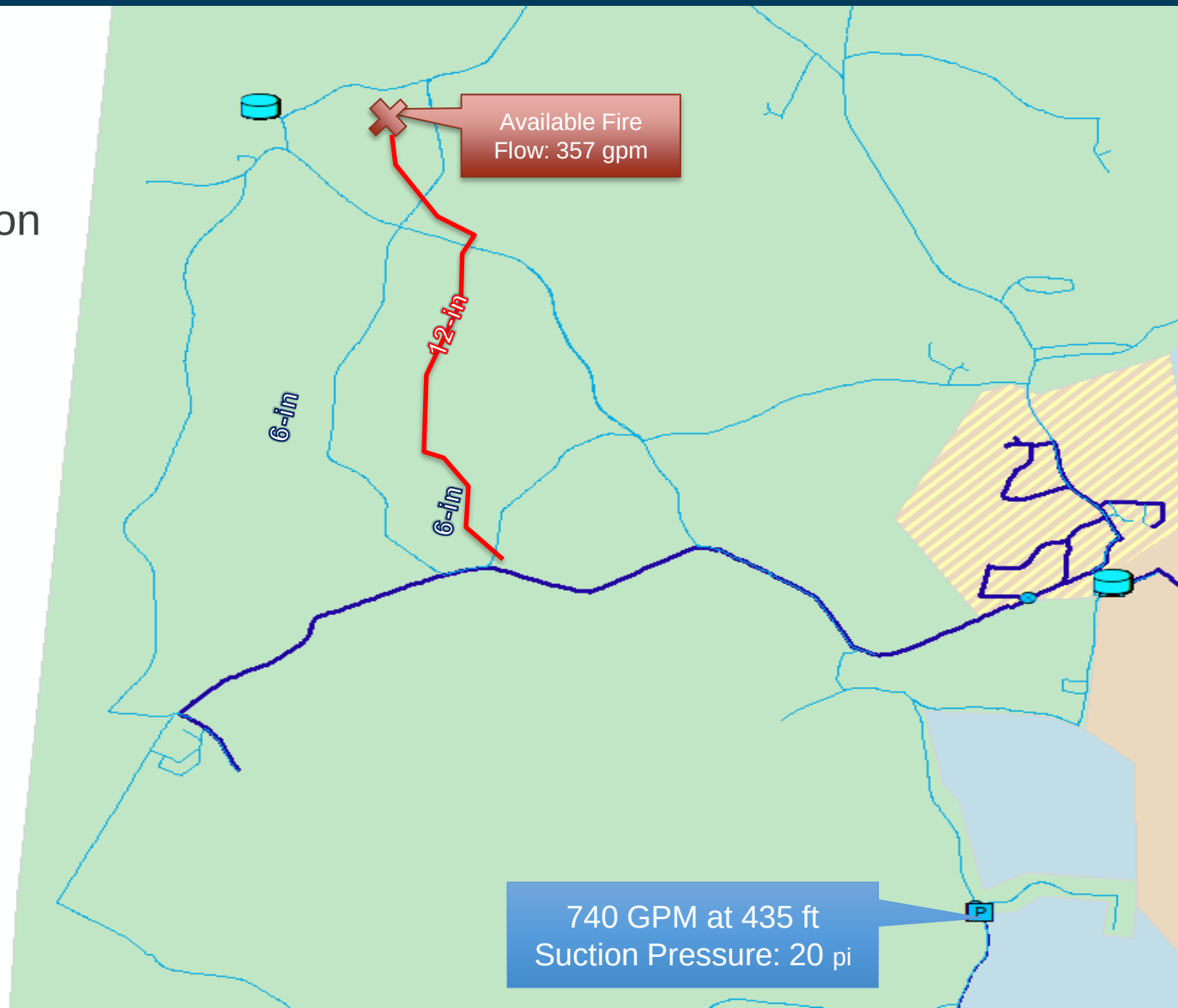
Green Hill Pump Station Option

Retire Sheffield Standpipe

Green Hill PS is limited to 740 GPM due to suction pressure (20 psi)

Installing **6+ miles** of 12-inch improves available fire flow at the Sheffield Standpipe site, but does not meet needed fire flows

Improvements would be required on the suction side (Junction Rd) and discharge side to strengthen connection towards Pallet One Inc.



CIP Project Goals and Recommendations

Targeted Areas for the Davie County Water Master Plan:

- Water quality concerns
- Frequent breaks
- Infrastructure nearing the end of useful life
- Extensions for targeted development areas identified in the Davie County Comprehensive Plan

- Current CIP has a 10 Year total of $4.8M for water and sewer extensions

Main Church Road – Phase 1 & 2

Blue Line – Phase 1

Violet Line – Phase 2

Main Church Road Phase 1 & 2

10,100	Feet of Trenched Pipe	
8	Inch Diameter	
$889,900	$11	/in/ft Construction cost for C900 PVC
$98,000	11%	Design and Permitting
$198,000	20%	Contingency
$1,185,000	Total	

3,900	Feet of Trenched Pipe	
400	Feet of Trenchless Installation Under I-40	
8	Inch Diameter	
$344,000	$11	/in/ft Construction cost for C900 PVC
$600,000	$1,500	/ft Trenchless Installation
$104,000	11%	Design and Permitting
$210,000	20%	Contingency
$1,258,000	Total	

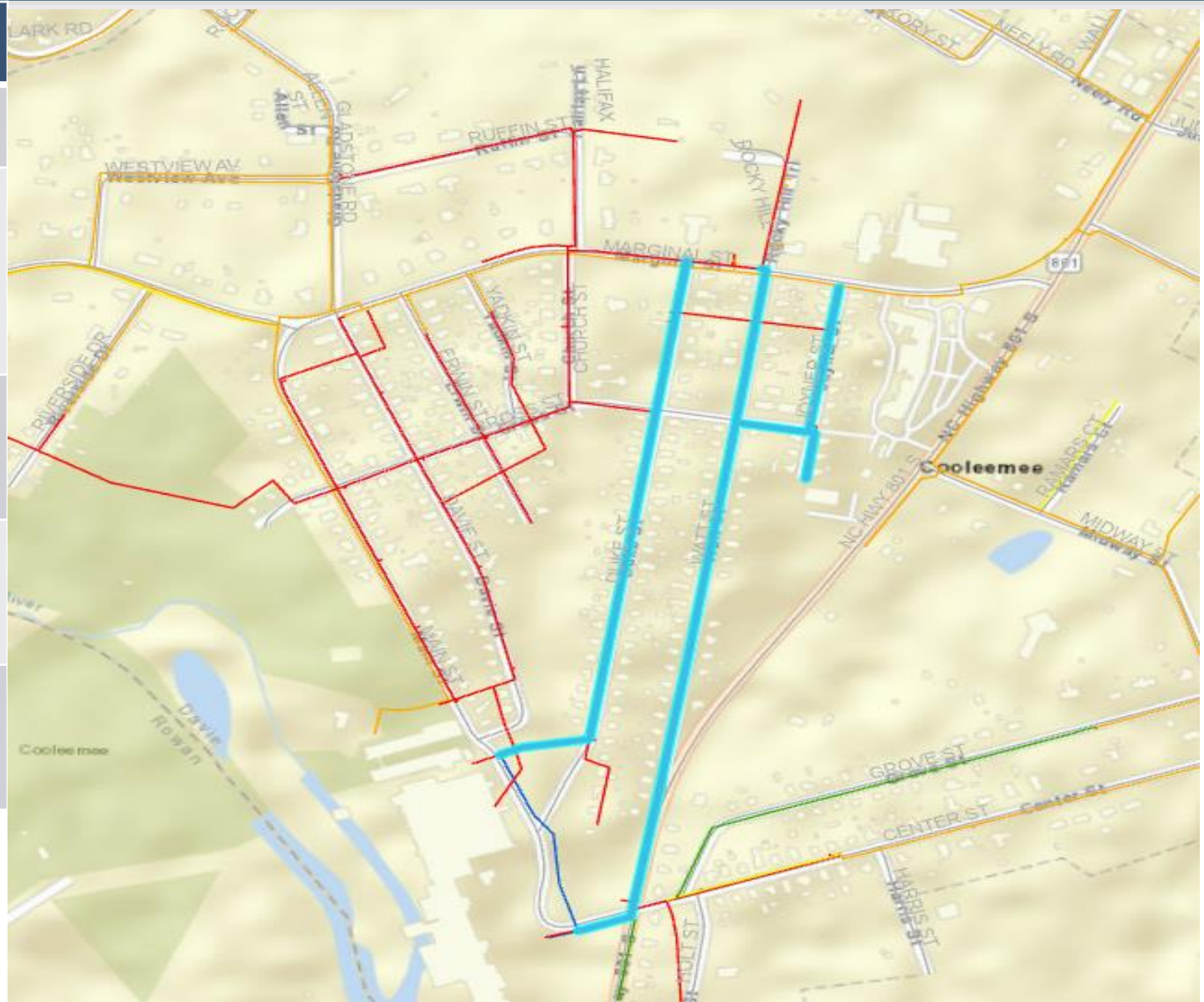
Model recommendation Yadkin Valley Road

4,000	Feet of Trenched Pipe	
6	Inch Diameter	
$264,000	$11	/in/ft Construction cost for C900 PVC
$40,000	15%	Design and Permitting
$61,000	20%	Contingency
$365,000	Total	

- **Water quality concerns**
- **Frequent breaks**
- **Infrastructure nearing the end of useful life**
- **Extensions for targeted development areas identified in the Davie County Comprehensive Plan**

Cooleemee Phase 1

7,050	Feet of Trenched Pipe	
		6 Inch Diameter
$466,000	$11	/in/ft Construction cost for C900 PVC
$70,000	15%	Design and Permitting
$108,000	20%	Contingency
$644,000	Total	

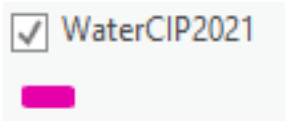


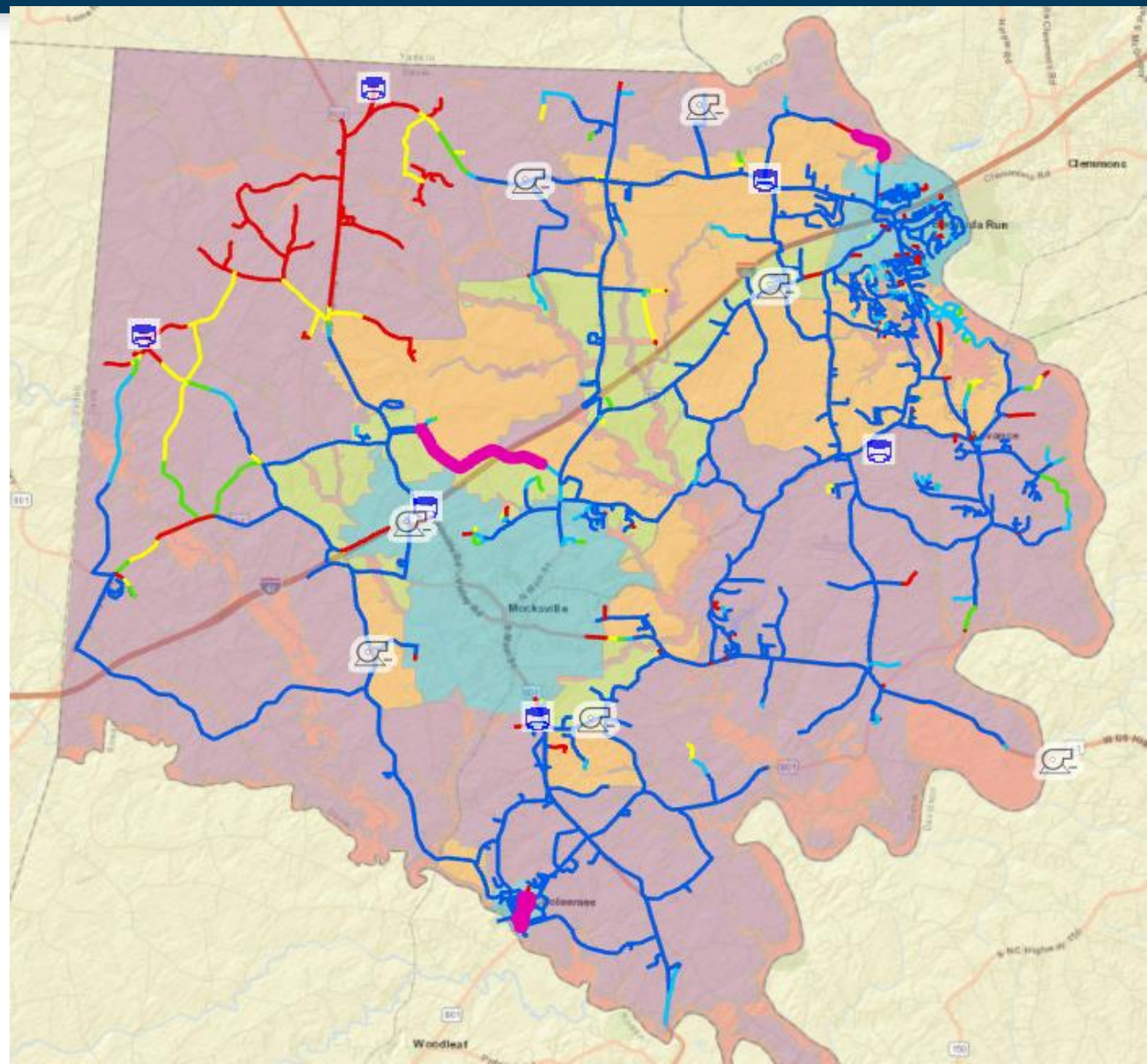
CIP Recommendations Summary

Project Name	Length	Diameter	Cost
Main Church Road Phase 1	10,100	8 inch	$1,185,000
Main Church Road Phase 2	4,300	8 inch	$1,258,000
Yadkin Valley Road	4,000	6 inch	$365,000
Cooleemee Water Phase 1	7,050	6 inch	$644,000
		Total	$3,452,000

CIP Recommendations With Current Water Age

Map ID	Project Name
A	Main Church Road Phase 1
B	Main Church Road Phase 2
C	Yadkin Valley Road
D	Cooleemee Water Phase 1





Davie County Public Utilities Capital Improvement Plan

Davie County Public Utilities CIP Projects FY 2021 - 2030

		1	2	3	4	5	
#	Uses of Funds	2021	2022	2023	2024	2025	5-yr Sub-Total
1	Cooleemee Water System Expansion	$825,000	$38,800,000				$39,625,000
2	SCADA Upgrade	$200,000	$125,000				$325,000
3	Carbon System Sparks Rd	$350,000					$350,000
4	New Water & Sewer Extension	$500,000	$400,000	$400,000	$500,000	$500,000	$2,300,000
5	Repair and Replacement of PP&V	$455,000	$312,000	$118,000	$174,000	$180,000	$1,239,000
6	Roof repair - Sparks WTP		$150,000				$150,000
7	Renovate Deadmon Rd PS			$200,000			$200,000
8	Renovate Greenhill PS				$200,000		$200,000
9	Replace 2400 lf Water Main in Cooleemee					$200,000	$200,000
	Grand Total	$2,330,000	$39,787,000	$718,000	$874,000	$880,000	$44,589,000

#	Sources of Funds	2021	2022	2023	2024	2025	5 yr Total
1	State Revolving Fund Loan	$825,000	$38,800,000				$39,625,000
2	Reserves	$550,000	$275,000				$825,000
3	Revenues From Rates	$955,000	$712,000	$718,000	$874,000	$880,000	$4,139,000
	Grand Total	$2,330,000	$39,787,000	$718,000	$874,000	$880,000	$44,589,000

		6	7	8	9	10	
#	Uses of Funds	2026	2027	2028	2029	2030	10-yr Total
1	Cooleemee Water System Expansion						$39,625,000
2	SCADA Upgrade						$325,000
3	Carbon System Sparks Rd						$350,000
4	New Water & Sewer Extension	$500,000	$500,000	$500,000	$500,000	$500,000	$4,800,000
5	Repair and Replacement of PP&V	$436,000	$443,000	$450,000	$457,000	$464,000	$3,489,000
6	Roof repair - Sparks WTP						$150,000
7	Renovate Deadmon Rd PS						$200,000
8	Renovate Greenhill PS						$200,000
9	Replace 2400 lf Water Main in Cooleemee						$200,000
	Grand Total	$936,000	$943,000	$950,000	$957,000	$964,000	$49,339,000

#	Sources of Funds	2026	2027	2028	2029	2030	10 yr Total
1	State Revolving Fund Loan						$39,625,000
2	Reserves						$825,000
3	Revenues From Rates	$936,000	$943,000	$950,000	$957,000	$964,000	$8,889,000
	Grand Total	$936,000	$943,000	$950,000	$957,000	$964,000	$49,339,000